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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/613,203

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Gurtej S. Sandhu

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09/06/2007

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EXAMINER

MALDONADO, JULIO J

ART UNIT

PAPER NUMBER

2823

MAIL DATE

DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/613,203

Applicant(s)

SANDHU ET AL.

Examiner

Julio J. Maldonado

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 June 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13, 52, 53 and 60-70 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13, 52, 53 and 60-70 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicants' addition of claims 63-70 as set forth in the reply filed 06/19/2007 is acknowledged.
2. Claims 1-13, 52, 53 and 60-70 are pending in the application.

Allowable Subject Matter

3. The indicated allowability of claims 52, 53 and 62 is withdrawn in view of the newly discovered reference(s) to Takehiro et al. (U.S. 6,403,441 B1, hereinafter Takehiro). Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-4, 8-13, 60-61, 63 and 67 are rejected under 35 U.S.C. 102(e) as being anticipated by Takehiro ('441).

Takehiro (Figs.2d, 4a and 4b) teaches a capacitor structure including a lower electrode (6) formed on a substrate (1) (Takehiro, column 6, lines 37 – 52); a plurality of high-k dielectric layers (9, 10, 11), wherein said plurality of said high-k dielectric layers (9, 10, 11) are made of barium strontium titanate (BST), said plurality includes a barrier layer (9) between the lower electrode (6) and the plurality of high-k layers (9, 10, 11),

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said plurality of high-k layers further includes an overlying layer defined by point A having an oxygen concentration that lower than an underlying layer defined by point B (Takehiro, Fig.4b and column 6, line 57 – column 7, lines 42); and an upper electrode (8) over said plurality of high-k dielectric layers (Takehiro, column 7, line 66 – column 8, line 8).

Takehiro fails to expressly disclose wherein at least tow layers of said dielectric layer of said plurality exhibit different degrees of oxidation. However, the recitation of lower degree of oxidation is seen to be a recitation of a dielectric layer of said plurality of layers having a lower concentration of oxygen with respect to another layer of said plurality. Therefore, Takehiro teaches the claimed limitation because Takehiro discloses an overlying BST layer having a lower concentration of oxygen than an underlying BST layer.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 5-7, 52, 53, 62, 64-66, 68-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takehiro ('441) in view of the following arguments.

Takehiro (Figs.2d, 4a and 4b) teaches a capacitor structure including a lower electrode (6) formed on a substrate (1) (Takehiro, column 6, lines 37 – 52); a plurality of high-k dielectric layers (9, 10, 11), wherein said plurality of said high-k dielectric layers

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(9, 10, 11) are made of barium strontium titanate (BST), said plurality includes a barrier layer (9) between the lower electrode (6) and the plurality of high-k layers (9, 10, 11), said plurality of high-k layers further includes an overlying layer defined by point A having an oxygen concentration that lower than an underlying layer defined by point B (Takehiro, Fig.4b and column 6, line 57 – column 7, lines 42); and an upper electrode (8) over said plurality of high-k dielectric layers (Takehiro, column 7, line 66 – column 8, line 8).

Takehiro fails to expressly disclose wherein at least tow layers of said dielectric layer of said plurality exhibit different degrees of oxidation. However, the recitation of lower degree of oxidation is seen to be a recitation of a dielectric layer of said plurality of layers having a lower concentration of oxygen with respect to another layer of said plurality. Therefore, Takehiro teaches the claimed limitation because Takehiro discloses an overlying BST layer having a lower concentration of oxygen than an underlying BST layer.

Still Summerfelt fails to disclose wherein said plurality of dielectric layers defines a thickness at most 200 angstroms; wherein said first dielectric layer has a thickness of at least 10 angstroms; wherein said plurality of dielectric layers comprises a first dielectric layer contacting said bottom electrode and defining a thickness of at least one monolayer; and wherein each layer of said plurality of high-k dielectric layers have individual thicknesses ranging from 10-40 angstroms. However, the selection of the thicknesses is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired

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dielectric layer. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to arrive at the claimed dimensions through routine experimentation.

Response to Arguments

8. Applicant's arguments with respect to claims 1-13, 52, 53 and 60-70 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Applicants are encouraged, where appropriate, to check Patent Application Information Retrieval (PAIR) (<http://portal.uspto.gov/external/portal/pair>) which provides applicants direct secure access to their own patent application status information, as well as to general patent information publicly available.


10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.

11. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax number for this group is 571-273-8300. Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.



Julio J. Maldonado
August 30, 2007

Julio J. Maldonado
Patent Examiner
Art Unit 2823



GEORGE R. FOURSON
PRIMARY EXAMINER